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July 2010
MT14230A-SM-SC MT1415A-MM-SC MT1430A-SM-SC MT1405A-MM-SC
MT14320A-SM-LC MT1415A-MM-LC MT1430A-SM-LC MT1405A-MM-LC

DFCS 4xT1/E1 Multiplexer

Multiplexes up to four T1/E1 copper circuits and
one optional 10/100 Ethernet UTP port onto a
fiber optic link.

Supports multimode and singlemode fiber
SC or LC connectors
Supports local and remote fiber and copper loopback modes



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FEDERAL COMMUNICATIONS COMMISSION AND
INDUSTRY CANADA RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer’s instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n’émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

Normas Oficiales Mexicanas (NOM)
Electrical Safety Statement
INSTRUCCIONES DE SEGURIDAD

- 1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
- 2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
- 3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
- 4. Todas las instrucciones de operación y uso deben ser seguidas.

Definitions of Terms

AIS	Alarm Indication Signal (all 1’s)
BERT	Bit Error Rate Test
LOF	Loss of frame
LOS	Loss of Signal
RAI	Remote Alarm Indication
RDI	Reverse Defect Indication, same as RAI

Specifications

Model Type	4xT1/E1 MUX
Protocols (TDM)	ANSI: T1.403, T1.102, AT&T: T62411, ITU: G.703, G.704, G.706, G.736, G.775, G.823, G.824, G.8261 ETSI: ETS 300 166
Protocols (Ethernet)	10BASE-T, 100BASE-TX, 100BASE-FX with 2044 bytes max. frame size
Copper Connectors	Ethernet: RJ-45 T1/E1: RJ-48
Fiber Connectors SFP: Dual Fiber:	LC SC, ST, LC
Controls	UTP Crossover, CableType / Distance, Loop, Fiber AIS, UTP AIS, Fiber Optic Test
LED Displays	Power, Test, RJ-45/RJ-48 Link, Fiber Optic Link
AC Power Input power requirements: Connector:	100 to 240VAC 50/60Hz 0.5A @ 120VAC IEC320
Dimensions	W: 6.7" x D: 5.51" x H: 1.87"
Weight	2.5 lbs
Compliance	UL, CE, FCC Class A
Temperature	
Standard:	0 to 50° C
Wide:	-40 to 60° C
Storage:	-40 to 80° C
Humidity	5 to 95% (non-condensing)
Altitude	-100m to 4000m
MTBF (hrs)	
AC Model	150,000

Ethernet traffic on the optional Ethernet port has a maximum throughput of 80Mbps.

- El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
- El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
- El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
- Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
- El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
- El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
- El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
- Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
- Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
- El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
- En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
- El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objetos liquidos no sean
derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:

A: El cable de poder o el contacto ha sido dañado; u

B: Objetos han caído o líquido ha sido derramado dentro del aparato; o

C: El aparato ha sido expuesto a la lluvia; o

D: El aparato parece no operar normalmente o muestra un cambio en su
desempeño; o

E: El aparato ha sido tirado o su cubierta ha sido dañada.

Verify the Transport module is operational by viewing the LED indicators.

LED Function "Legend"	Color	Off State	ON / Blinking State
Power "Pwr"	Green	No power	Module has power
Power "PS1", "PS2", "PS3"	Green	N/A	N/A
Fiber Optic "FO"	Green	No fiber link	ON: Fiber link is active 10 Hz Blinking: Data activity
10Mbps UTP "10"	Green	10Mbps not selected or disconnected	ON: Active 10Mbps UTP link 10 Hz Blinking: Data activity
100Mbps UTP "100"	Green	100Mbps not selected or disconnected	ON: Active 100Mbps UTP link 10 Hz Blinking: Data activity
UTP Full-Duplex "FDX"	Green	Half-duplex	Full-duplex

Table 5: Transport Module LED Indicators

LED Indicator		Function	
Sys	Stat	Local	Remote
Off	Off	No power	N/A
Green - ON	Green - 1Hz	Normal	Not peered with remote Mux (searching)
	Green - 5Hz	Normal	Peering started with remote Mux, but not completed
	Green - ON	Normal	Peered with remote Mux
Yellow - ON	Green - 1Hz	Local fiber loopback	Not peered with remote Mux (searching)
	Green - 5Hz	Local fiber loopback	Peering started, but not completed with remote Mux
	Green - ON	Local fiber loopback	Peered with remote Mux
Yellow - 1Hz	Green - 1Hz	Remote fiber loopback initiated	Not peered with remote Mux (searching); loopback failed
	Green - 5Hz	Remote fiber loopback initiated	Peering started, but not completed with remote Mux; loopback failed
	Green - ON	Remote fiber loopback initiated	Peered with remote Mux; loopback okay
	Yellow - ON	Remote fiber loopback initiated	Peered with remote Mux; loopback failed
Yellow - 5Hz	Green - ON	Responding to remote fiber loopback	Peered with remote Mux; loopback okay
	Yellow - ON	Responding to remote fiber loopback	Peered with remote Mux; loopback refused [possible if Copper Loopback is active]
Alternating Green & Yellow - 1Hz	Green - 5Hz	Circuit Test (BERT-test head) initiated	Peering started, but not completed with remote Mux; circuit test failed
	Green - ON	Circuit Test (BERT-test head) initiated	Peered with remote Mux; circuit test okay
	Yellow - ON	Circuit Test (BERT-test head) initiated	Peered with remote Mux; circuit test failed
Alternating Green & Yellow - 5Hz	Green	Responding to Circuit Test (comparator)	Peered with remote Mux; circuit test okay
	Yellow	Responding to Circuit Test (comparator)	Peered with remote Mux; circuit test failed

Table 4: “Sys” and “Stat” LED Indicators

The same LED has the capability to be green or yellow depending on the condition as shown in the table above. When condition indicates both colors are blinking at the same time, this will appear as an alternating pattern.

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Product Overview

The *DFCS* 4xT1/E1 MUX multiplexes up to four T1/E1 copper circuits and one optional 10/100 Ethernet UTP port onto a fiber optic link. The aggregated services can be extended up to 30km across a fiber pair. The 4xT1/E1 MUX must be used in pairs (bookends) across dark fiber.

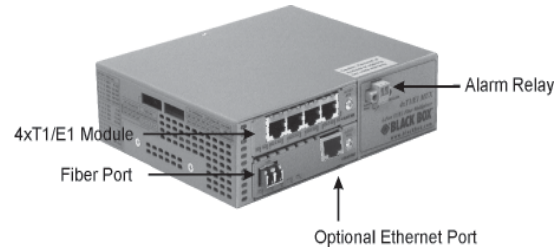


Figure 1: 4xT1/E1 Multiplexer with Optional Ethernet Port

Installation Procedure

- 1) Configure DIP-switches
- 2) Install MUX with AC Power
- 3) Connect Cables
- 4) Verify Operation

1) Configure DIP-switches

DIP-SWITCH BANK 1

SW1 - SW4: Local Loopback Port 1 - Port 4 “Off / LBx”

These DIP-switches control the local loopback function for each T1/E1 port. When the DIP-switch is in the “LBx” position (where “x” is the T1/E1 port number), the corresponding port initiates a loopback per Figure 3. AIS (all 1s signal) from the local unit is transmitted across the fiber and out the corresponding T1/E1 port on the remote unit. When the DIP-switch is in the “OFF” (default), the port functions normally.

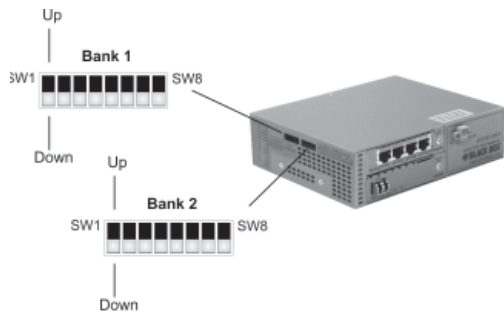


Figure 2: DIP-switch Location

4) Verify Operation

Verify the MUX is operational by viewing the LED indicators.

LED Legend	Function	Color
Pwr	Power	Green
Sys	Local System Status	Green/Yellow
P1 Lnk	Port 1 Local Link T1/E1 Status LED	Green/Yellow
P1 Rmt	Port 1 Remote Link Status LED	Green/Yellow
P2 Lnk	Port 2 Local Link T1/E1 Status LED	Green/Yellow
P2 Rmt	Port 2 Remote Link Status LED	Green/Yellow
P3 Lnk	Port 3 Local Link T1/E1 Status LED	Green/Yellow
P3 Rmt	Port 3 Remote Link Status LED	Green/Yellow
P4 Lnk	Port 4 Local Link T1/E1 Status LED	Green/Yellow
P4 Rmt	Port 4 Remote Link Status LED	Green/Yellow
Stat	Remote System Status	Green/Yellow

Table 2: 4xT1/E1 LED Indicators

LED	Color/State	Function
Lnk	OFF	Loss of power or the Port Alarm Relay/LED switch is disabled
	Green - ON	Local connected
	Green - 1Hz	Local port LoS (RED Alarm)
	Yellow - ON	Local port receiving AIS
Rmt	Yellow - 1Hz	Local port in T1/E1 copper loopback mode
	OFF	Loss of power or the Port Alarm Relay/LED switch is disabled
	Green - ON	Remote T1/E1 port connected
	Green - 1Hz	Remote T1/E1 port not connected or not synchronized
Lnk and Rmt (all ports)	Yellow - ON	Remote T1/E1 port connected but receiving LoS, AIS or port in local loopback
	Sequential Pattern (left to right) Amber to Green	T1/E1 MUX Initializing

Table 3: “Lnk” and “Rmt” LED Indicators

3) Connect Cables

- When using the SFP model, insert the SFP Fiber transceiver into the Port 1 SFP receptacle on the Transport module
NOTE: The release latch of the SFP Fiber transceiver must be in the closed (up) position before insertion.
- Connect a Category 5 or better cable to the RJ-48 connectors on the DFCS T1/E1 MUX, and attach the connectors at the other end of the UTP cable to the network equipment.
- When configured for E1 coax operation, use the optional adapter cables to convert the RJ-48 interface ports to dual BNC.
- When using a Transport module with the optional Ethernet port (see Figure 1 on page 3), connect the Ethernet 10/100 UTP port via a Category 5 or better cable to an external 10BASE-T or 100BASE-TX Ethernet device.
- Connect an appropriate multimode or single-mode fiber cable to the fiber port of the Transport module. It is important to ensure that the transmit (TX) is attached to the receive side of the device at the other end and the receive (RX) is attached to the transmit side. When using single-fiber (SF) models, the TX wavelength must match the RX wavelength at the other end and the RX wavelength must match the TX wavelength at the other end.

NOTE: Do not remove the modules from the chassis. Access to available DIP-switches can be found on the side of the chassis.

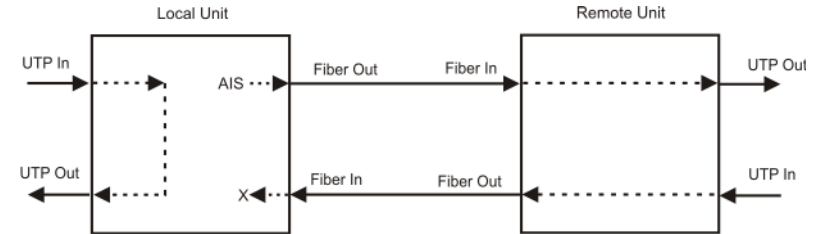


Figure 3: Local Loopback

SW5 - SW8: T1/E1 Line Configuration Settings

These DIP-switches configure the MUX for T1/E1 operation and the copper line build-out.

SW5	SW6	SW7	SW8	Description
Down	Down	Down	Down	T1 DSX-1: 0' to 133' (default)
Down	Down	Down	Up	T1 DSX-1: 133' to 266'
Down	Down	Up	Down	T1 DSX-1: 266' to 399'
Down	Down	Up	Up	T1 DSX-1: 399' to 533'
Down	Up	Down	Down	T1 DSX-1: 533' to 655'
Down	Down	Down	Down	T1 DS1: 0dB
Down	Up	Down	Up	T1 DS1: -7.5dB
Down	Up	Up	Down	T1 DS1: -15dB
Down	Up	Up	Up	T1 DS1: -22.5dB
Up	Down	Down	Down	E1 75 Ω Coax/BNC Standard
Up	Down	Down	Up	E1 120 Ω RJ-45/48 Standard
Up	Down	Up	Down	E1 75 Ω Coax/BNC Extended
Up	Down	Up	Up	E1 120 Ω RJ-45/48 Extended

Table 1: T1/E1 Line Build-Out

DIP-SWITCH BANK 2

SW1 - SW4: Port Alarm Relay/LED P1-P4 Alarms "Act / Off"

These DIP-switches enable/disable the port alarm relay and LED function for the corresponding port. When this DIP-switch is in the "Act" down position (default), the alarm relay and "Lnk" and "Rmt" LEDs are enabled. When the DIP-switch is in the "Off" up position, the alarm relay and "Lnk" and "Rmt" LEDs are disabled.

The Port Alarm Relay is a two pin terminal connector located on the front panel of the 4xT1/E1 Multiplexer. It will close when any of the following port alarm conditions are detected (i.e. alarm relay port 1 will activate when an alarm condition is detected on port 1).

- Power loss
- The detection of AIS or Loss of Signal (LoS) on the T1/E1 copper port
- The detection of AIS or LoS on any remote T1/E1 copper port
- When the T1/E1 MUX is not peered with its remote partner

SW5: Circuit Test (C/T) Mode “Off / On”

When this DIP-switch is in the “Off” down position (default), the Circuit Test Mode is disabled. When this DIP-switch is in the “On” up position, the Circuit Test Mode is enabled. When Circuit Test mode is enabled, both MUXes will transmit a known test pattern. The test pattern is received by the other unit and checked for errors. AIS is transmitted out all T1/E1 ports and incoming T1/E1 traffic is discarded. See Figure 4 for Circuit Test Mode diagram.

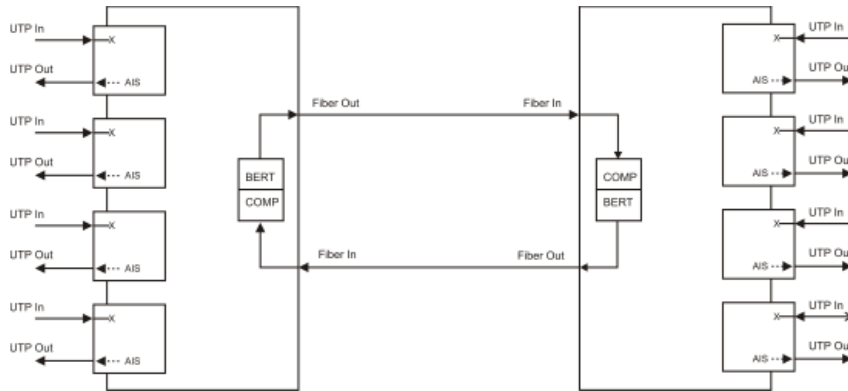


Figure 4: Circuit Test Mode

SW6: Local Fiber Loopback “Off / Loc”

When this DIP-switch is in the “Off” down position (default), local fiber loopback is disabled. When this DIP-switch is in the “Loc” up position, local fiber loopback is enabled on the MUX. AIS is transmitted across the fiber and out all remote T1/E1 ports. Incoming T1/E1 traffic at the remote unit is discarded. See Figure 5 for local fiber loopback diagram.

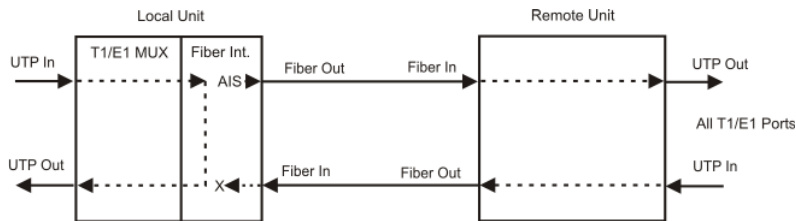


Figure 5: Local Fiber Loopback

SW7: Remote Fiber Loopback - “Off / Rmt”

When this DIP-switch is in the “Off” down position (default), remote fiber loopback is disabled. When this DIP-switch is in the “Rmt” up position, remote fiber loopback is enabled on the MUX. In this mode, the local unit forces the remote MUX into loopback. AIS is transmitted out all remote T1/E1 ports. Incoming T1/E1 traffic at the remote unit is discarded. See Figure 6 for remote fiber loopback diagram.

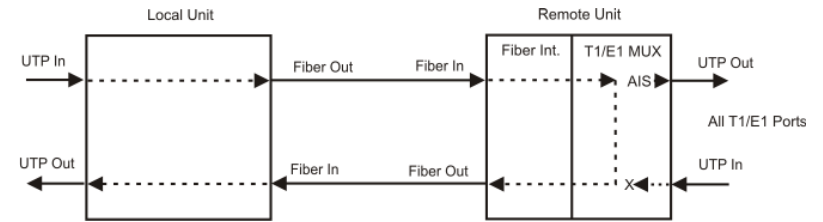


Figure 6: Remote Fiber Loopback

SW8: T1/E1 Line Codes - B8ZS/HDB3 or AMI

When this DIP-switch is in the “B8ZS/HDB3” down position (default), the MUX is configured for B8ZS (T1) or HDB3 (E1) line coding. When the DIP-switch is in the “AMI” up position, the MUX is configured for AMI line coding.

2) Install MUX with AC Power**a) AC Powered Chassis Site Preparation**

Power source should be available within 5 ft. of the chassis and installed per the National Electrical Code ANSI/NFPA-70.

This equipment requires a 100-240VAC, 0.5Amp, 50/60Hz power outlet. Appropriate overloading protection should be provided on the AC power source outlets utilized.

The standard operating temperature of this equipment is 0 to 50 degrees C. If installed in a closed or multi-module rack assembly, the operating ambient temperature of the rack must not exceed the maximum rated 50 degrees C. See specifications on page 13 for wide temperature ranges.

Installation of the equipment should be such that the air flow in the front, back and side vents of the chassis are not compromised or restricted.

Never use this equipment to carry any weight except its own. Never use it as a shelf to support the weight of other equipment.

b) AC Powered Chassis Mounting

Attach the AC power cord to the back of the Power Receptacle and plug into the AC outlet. Any installed DFCS modules will illuminate the power LED.



Figure 7: Rear View with Power Cord